DRUG INDUCED HEARING LOSS: A CASE STUDY

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ABSTRACT

Introduction: Hearing impairment occasionally accompanies medications such as aspirin, non-steroidal anti-inflammatory drugs, and cis-platin (Seligmann et al. 1996). Use of these medications, alone or in combination with exposure to hazardous noise, can result in high-frequency sensorineural hearing loss. The reactions of these drugs may affect all structures of the hearing organ, and result in sensorineural or mixed hearing loss.

Aim of the study: This study investigates the configuration, type and degree of hearing loss of a 12 year old boy who had taken drugs which were prescribed to him after he met with an accident 3 years ago. The drugs which were prescribed to him were Coenflex, Niacin(Amikacin) Injection and SN10. In addition, audiologic management is discussed with reference to audiologic assessment, counseling, and use of amplification.

Method: Audiological assessment included clinical examination and otoscopy. Pure tone audiometry was undertaken using Audiometer MAICO MA 53, including bone conduction testing, impedance testing using GSI 38 Impedance Audiometer. Speech and Language Assessment was done for the case using various Speech Assessment Tools. Linguistic Profile Test and Articulation Test in Bengali was administered.

Results: The patient revealed a profound sensorineural hearing loss in Right ear and a severe high frequency sensorineural hearing loss in Left ear with impaired speech discrimination ability bilaterally as well as misarticulated speech. The child was diagnosed as Age Appropriate Language with misarticulation.

Discussion: In this study a subject who had been taking certain drugs namely SN10, Niacin and Coenflex developed hearing loss with misarticulated speech. These had been prescribed to the patient as antitoxins after the boy had met with an accident. Audiological tests revealed a profound sensorineural hearing loss in Right ear and a severe high frequency sensorineural hearing loss in Left ear with impaired speech discrimination ability bilaterally. When a hearing loss has been documented, aural rehabilitation should be initiated. Counseling the patient and his family regarding the hearing loss provides an opportunity to explain the use of amplification as a rehabilitative approach.

Conclusion: The prevention and rehabilitation is an essential measure of such cases. In selected cases with bilateral profound hearing loss or total deafness, cochlear implants may prove effective. Further improvements in otologic diagnostics and therapy may allow better prevention and management of drug induced-related hearing changes.
INTRODUCTION

Clinically used drugs and chemical agents may potentially cause adverse effects to the human auditory and vestibular systems. Many of them, such as aminoglycosides, quinine and cisplatin, can play a critical role in the treatment of serious or life-threatening diseases; others, like loop diuretics or salicylates, offer such important therapeutical effects compared to the ototoxic side effects that the ototoxicity risk can be considered to be of minor importance. The problem of ototoxicity is more acute in developing countries, where highly effective and low-cost drugs are more easily prescribed without adequate monitoring. Medical awareness of doses, forms of administration, populations at risk, and possible synergism is necessary in order to develop appropriate care in the prescription of drugs with ototoxic side effects. Relatively recent issues such as risk-benefit analysis, patient-informed consent, and quality-of-life considerations, particularly when life expectancy can be low, are also to be considered. More than 230 drugs are known to cause hearing loss. Hearing loss ranges from mild to profound and is temporary or permanent. It destroys hearing in very high frequencies (Bauman, 2016)

NEED OF THE STUDY

This investigation was aimed at characterizing degree and the type of hearing loss as a side effect to certain drugs which were given after an accident at the age of nine years. It was also aimed at providing proper rehabilitative measures to the patients having such problems.

OBJECTIVE OF THE STUDY

To investigate hearing impairment in a child after taking high doses of medication (Coenflex, Niacin Injection and SN10) post-morbidly.

METHOD

A boy aged 12 years was taken as a subject for the study. A thorough case history of the patient was taken. Audiological assessment included clinical examination and otoscopy. Pure tone audiometry was done using Audiometer MAICO MA 53, including bone conduction testing and impedance testing using GSI 38 Impedance Audiometer. The degree of hearing loss was classified using the average of hearing thresholds at 0.5, 1, and 2 KHz frequencies. Hearing Aid Trial comprised of both aided and unaided responses using verbal and non-verbal stimuli and this was done using Audiometer AD229.

Speech and Language Assessment was done for the case using various Speech Assessment Tools. Linguistic Profile Test (LPT, Suchitra and Karanth, 1993) and Articulation Test in Bengali (Banik and Karanth, 1988) was administered. The child was diagnosed as Age Appropriate Language with misarticulation.

RESULTS

Audiologic assessment as it is revealed in Table 1a, profound sensorineural hearing loss in Right ear and a severe high frequency sensorineural hearing loss in Left ear with impaired speech discrimination ability bilaterally as depicted in Table 1b.

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>AC of Right Ear (dB)</th>
<th>AC of Left Ear (dB)</th>
<th>BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>80</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>500</td>
<td>90</td>
<td>85</td>
<td>60</td>
</tr>
<tr>
<td>1000</td>
<td>100</td>
<td>90</td>
<td>65</td>
</tr>
<tr>
<td>2000</td>
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<tr>
<td>4000</td>
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<tr>
<td>6000</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>8000</td>
<td>115</td>
<td>110</td>
<td></td>
</tr>
</tbody>
</table>

Table 1b: Speech reception threshold(SRT), Speech discrimination Score(SDS), Uncomfortable level(UCL), Most Comfortable level(MCL).
Impedance audiometry revealed A type tympanogram with reflexes absent bilaterally except at 500Hz as depicted in Table 2.

Table 2: Tympanometric findings of right and left ears. ECV - external canal volume

<table>
<thead>
<tr>
<th>Imittance parameters</th>
<th>Right Ear</th>
<th>Left Ear</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECV</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Compliance (cm³)</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Pressure (dapa)</td>
<td>-20</td>
<td>-25</td>
</tr>
<tr>
<td>Gradient</td>
<td>65</td>
<td>75</td>
</tr>
<tr>
<td>Tympanogram type</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

Hearing aid trial was also performed and the child was recommended a strong class level body hearing aid.

Speech and Language Assessment: No misarticulation in vowels. Misarticulation in consonants mostly in word middle and final positions of substitution and omission types. The Speech and Language Assessment revealed that the child misarticulated in the following speech sounds. Substitution in the following phonemes [p], [pʰ], [b], [d], [t], [jŋ], [j], [ɾ], [ɾ], [l], [l]. Omission in [tʰ].

DISCUSSION

Of the various drug effects, neurological complications and hearing impairment are of particular importance. Despite relatively high number of both animal and human studies, clear-cut data on the incidence, type and severity of drug-induced ear toxicity are scarce. Drug-induced damage can affect the hearing organ, especially the middle and inner ear up to the central auditory pathways. It may result in, sensorineural or mixed (i.e., with both conductive and sensorineural component) hearing loss. Sensorineural hearing loss can have sudden or progressive character. SNHL typically appears several months or years after completion of treatment. It develops slowly after the intake of drugs. Damage to the cochlear nerve is common. Studies reporting clinical data on use of drugs which had caused sensorineural hearing deficit can occur gradually and progressively with the use of drugs over a span of 2-3 years (Moretti, 1976; Leach, 1965). Niacin (Amikacin) is an injectable antibiotic. It is indicated in short term treatment of serious infections to susceptible strain. Amikacin is given for infections of organisms which are gram –ve or staphylococci. It is prescribed for serious cases of pneumonia, meningitis, urinary tract infection and tuberculosis. Its side effect is hearing loss and vertigo. (Johnson 2016).

In this study a subject who had been taking certain drugs namely SN10,Niacin and Coenflex after the accident developed hearing loss with misarticulated speech. These had been prescribed to the patient as antitoxins after the boy had met with an accident. Audiological tests revealed a profound sensorineural hearing loss in Right ear and a severe high frequency sensorineural hearing loss in Left ear with impaired speech discrimination ability bilaterally.

Toxic substances are widely used in industry, agriculture, and transportation. Some are ototoxins and some neurotoxins. These materials can cause a variety of insults to the auditory mechanism, such as sensorineural hearing loss (Barregard and Axelsson 1984), retrocochlear hearing loss (Hormes, Filley et al. 1986), and lesions in the higher auditory pathways (Moshe et al. 2002). When a hearing loss has been documented, aural rehabilitation should be initiated. Counseling the patient and his family regarding the hearing loss provides an opportunity to explain the use of amplification as a rehabilitative approach. The possibility of a progressive loss and speech problems suggests the need for periodic re-evaluations after the initial assessment is completed.

CONCLUSION

Hearing loss may occur in patients due to administration of certain drugs caused by either the disease process or the treatment method. Appropriate audiologic and speech-language therapeutic services include hearing assessment (regular hearing monitoring), speech-language assessment, counseling, hearing aid trial and fitting and speech-language therapy. Effective audiological management is essential to ensure adequate communication ability, psychological adjustment, and general case management for the
patient with hearing loss due to these drugs. Due to its relatively high frequency, and serious implications, this should attract more attention. And an attempt should be undertaken to prevent the hearing loss.

Uniform method of monitoring for all potentially ototoxic therapeutic drugs, does not seem reasonable or practical. It is recommended, however, that the individual’s auditory function be assessed for a particular drug being employed. Protocols and exams should be easy, quick, sensitive, reliable, and as objective as possible. Benefits of audiological monitoring include the opportunity to change the patient's treatment course, improvement of patient and family awareness of the impact of hearing impairment, timely prescription of amplification devices and commencement of speech-language therapy. Finally, particular attention should be paid to high-risk populations such as neonatal intensive care unit patients.

REFERENCES

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